# Midwest Energy, Inc.

***Relay Replacement for Knoll Substation***

## Abstract

Midwest Energy, Inc. (Midwest) is deploying new smart relays at its Knoll transmission substation. These relays include synchrophasor measurement technologies that can increase grid operators' visibility of bulk power system conditions in near real time, enable earlier detection of problems that threaten grid stability or cause outages, and facilitate sharing of information with neighboring control areas. Having access to better system operating information allows Midwest to improve power system models and analysis tools, increasing reliability of grid operations.

## Smart Grid Features

***Communications infrastructure*** includes the deployment of new wiring and a radio channel for relay of phasor data to Midwest Energy control center and to the North American Synchro Phasor Initiative (NASPI) data concentrator. All communications wiring at Knoll substation will be replaced as part of this project.

***Wide-area monitoring, visualization, and control systems*** involve new relay equipment not previously available for this area of the Kansas transmission grid. This equipment provides a more expansive view of the bulk power system and simultaneously reveals dynamic operating conditions, such as voltage and frequency information.

Through the project, Midwest is implementing ***advanced transmission applications*** for the synchrophasor system, including:

- **Angle and frequency monitoring** provides grid operators and engineers with detailed information about grid conditions and power flows.
- **Post-mortem analysis** enables power system engineers and grid operators to analyze disturbances and large-scale system events, to better understand their causes and to improve future system models and operations.
- **Voltage and voltage stability monitoring** provides grid operators and engineers with detailed information about grid conditions and system stability.
- **Improved state estimation** infers and imputes system conditions for the parts of the transmission grid without monitoring equipment.
- **Steady-state benchmarking** analyzes data from the new phasor measurement units to improve monitoring of power flow throughout the transmission system.

## At-A-Glance

**Recipient: Midwest Energy, Inc.**

**State: Kansas**

**NERC Region: Southwest Power Pool**

**Total Budget: $1,424,514**

**Federal Share: $712,257**

**Project Type: Electric Transmission Systems**

**Equipment**

- **9 Relay-based Phasor Measurement Units**
- **Synchrophasor Communications Network**

**Advanced Applications**

- **Angle and Frequency Monitoring**
- **Post-Mortem Analysis**
- **Voltage and Voltage Stability Monitoring**
- **Improved State Estimation**
- **Steady-State Benchmarking**

**Key Targeted Benefits**

- **Reduced Wide-scale Blackouts**
- **Improved Electric Service Reliability**
- **Reduced Truck Fleet Fuel Usage**
- **Reduced Greenhouse Gas and Criteria Pollutant Emissions**

**Midwest Energy, Inc.** *(continued)*

## Timeline

| Key Milestones | Target Dates |
|---|---|
| Phasor measurement unit/phasor data concentrator deployment begins | Q4 2010 |
| Phasor measurement unit system deployment completed | Q2 2011 |

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